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Abnormal returns for IPOs on the Swedish stock exchange

The effect of underwriters on short-run post-IPO performance

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Abstract

We examine the occurrence of underpricing and short-term performance of a sample of 216 Swedish IPOs between 2017-2021. The theories used are the Efficient Market Hypothesis, Underpricing, Information asymmetry which contains both the Principal Agent Theory and the Signaling Theory, and beyond that, the Winner's curse. We conduct an event study to measure the cumulative abnormal returns up until 15 days after the IPO, which is followed by five multivariate regressions. We find a statistically significant average market adjusted underpricing of 9.37 percent and that IPOs with large underwriters tend to perform better. The largest underwriters in our sample shows an average abnormal return of 14.95 percent for the initial fifteen days of trading, compared to 3.11 percent for the smallest. Further, through the regression made, no statistical significance was found regarding the underwriter's size. However, variables such as the total costs of the IPO, the state of the stock market and the amount of the guarantee commitments of cornerstone investors of the IPO were shown to be statistically significant by the regressions.

Key words: IPO, Underpricing, Event Study, Multivariate Regression, Efficient Market Hypothesis, Winner's Curse

Table of Content

1. Introduction

1.1 Background

There are a variety of ways to finance a business. One common way is through an initial public offering (IPO), where a company goes public and its shares become traded on a stock exchange. In an IPO, the issuing firm partner up with an underwriter acting as financial advisor in the transaction, working closely with the issuing firm. The underwriter sets the issuing price and sells the securities through the underwriters' distribution network. Furthermore, the underwriter assigned can have an impact on the outcome of the IPO (Carter & Manaster, 1990). Previous research has shown that IPOs, on average, generate abnormal short-term returns, meaning that there is a difference between the actual return and the expected return for securities. In a study of 209 Chinese IPOs from 2001 to 2003, Jiang and Leger find that the average IPO firm yielded an abnormal return of 117.48 percent from the offering price of the IPO compared to the first day closing price (Jiang & Leger, 2010). Studying 649 IPOs in the United States between 1975 and 1982, Chalk and Peavy (1987) find that the mean return is 21.65 percent at the end of the first trading day. Researchers have long tried to find the explanation behind this abnormality. One explanation put forward by Rock (1986) is based on a theory of information asymmetry between the issuers and the market. This leads to the offering firm having to set a lower issuing price (underprice its shares) to ensure investors with less information will participate in the IPO. Another possible explanation for the observed underpricing is the principal agent problem between the issuing firm (principal) and underwriter (agent), which comes as an effect of different incentives between the parties mentioned (Jensen & Meckling, 1976). A third possible explanation to underpricing has been put forward by Allen and Faulhaber (1989), namely that underpricing comes as an effect of the issuing firm will to signal to their potential investors that the firm is good and that only the best firms can afford to regain the cost of underpricing.

The reason for underpricing and abnormal positive returns shortly after IPO is somewhat discussed with many different possible explanations. Even if the reason for the abnormal returns is not clear, it is an interesting anomaly in the otherwise efficient market.

1.2 Purpose

The purpose of this paper is to investigate the prevalence of underpricing and subsequent abnormal first day returns in Swedish IPOs. Specifically, we examine how the size of the

underwriter, as well as other possible explanatory variables, affects underpricing and short-term returns IPO, an area quite unexplored in Sweden. Furthermore, we test multiple financial theories regarding IPOs. First, we conduct an event study on the IPOs on the Swedish market from January 2017 to March 2021, in order to estimate the possible abnormal returns. Thereafter, we perform a multivariate regression in order to examine what factors impact underpricing and short-term returns. The purpose and goal are thus to contribute to a deeper understanding about, and predictability of, Swedish IPOs.

1.3 Hypothesis and research questions

We hypothesize that there will be underpricing in Swedish IPOs due to findings of previous studies. Further, we hypothesize that the underwriter's size influences underpricing and short-term IPO returns. To test our two hypotheses, the following research questions have been formulated.

- Is there over/underpricing on the Swedish stock market? If so, do larger underwriters IPOs tend to underprice more than smaller underwriters?
- Do IPOs on average have a short-term abnormal positive return?
- Do the following factors affect underpricing or short-term abnormal return?
    - The size of the underwriter?
    - The market cap of the issuing firm?
    - The state of the stock market?
    - The cost of the IPO?
    - The amount guaranteed by institutional investors prior to the IPO?
    - The age of the firm?

1.4 Limitations of the study

In order to more effectively answer our research questions some limitations have been constructed. The thesis focuses solely on the Swedish market and the concerned IPOs listed at the Swedish Small, Mid and Large Cap, First North and Spotlight Market. Every IPO on the selected markets, between January 2017 and March 2021, have been collected and tested in the event study and the regression analysis. The particular time interval was chosen as it reflects a period of the stock market that has experienced different conditions, with sharp declines such as the COVID-19-crash of March 2020, long periods of consolidations, and also stable

uptrends. By including IPOs over a period with different market conditions, our sample includes observations across cycles, hopefully isolating any consistent impact stemming from different market conditions and the size of the underwriter. The data set consists of 216 firms, 121 from First North, 58 from Spotlight, and 12, 23 and 5 from Small, Mid and Large Cap respectively. In total, these IPOs have been backed by 42 unique lead underwriters.

While many studies in this field have studied both short and long-term IPO returns, we have chosen to strictly focus on the short-term returns, resulting in a narrower scope. Furthermore, we distinguish between underpricing and short-term abnormal returns, defined as the return generated 15 days after the listing. This cut-off point is subject to discussion, as one could argue that any abnormal returns generated 15 days after an IPO could still be returns generated from significant underpricing. Throughout the paper, we differentiate between these two.

1.5 Thesis structure

The thesis is structured as follows. We describe the theoretical framework, review previous research and elaborate on the most important theories on which this paper builds in section 2. Section 3 consists of a methodology review, explaining the main methods used and evaluating the strengths and drawbacks of the chosen statistical method. We go on to present the data and dummies in section 4 and present and discuss the findings in section 5. Lastly, we conclude the paper in a concluding discussion and propose future research areas in section 6.

2. Theory & literature review

This section reviews the current literature and previous research on the area. In section 2.1, the efficient market hypothesis is presented. The phenomena of IPO underpricing is presented in in section 2.2, information asymmetry in section 2.3 and lastly the recent findings on Winner's curse in section 2.4.

2.1 Efficient market hypothesis

Eugene Fama (1970) published his paper *Efficient Capital Markets: a review of theory and empirical work* was in the Journal of Finance in 1970, containing empirical evidence of his efficient market hypothesis (EMH). Fama (1970) argues that the price of a stock reflects all available information, at least to some degree. Based on the degree of market efficiency there are different implications. The market can be efficient in a weak form, meaning that an investor cannot receive higher risk adjusted returns than the general market based on only historical data. If the market is semi-strong efficient, the implications are that it is unfeasible to earn a risk adjusted return which is higher than the market over time, based on all available public information. If the market is efficient in its strong form, Fama argues that one cannot perform better than the market, even with inside information (Fama, 1970).

In IPOs however, as stated earlier, abnormal short-term returns have been observed (Chalk & Peavy, 1987). If participating in an IPO on average generates higher returns than the overall market, what implications does this have in relation to the EMH? To test this, we formulate our first hypothesis:

Hypothesis 1: The short-term average market adjusted returns for Swedish IPOs are larger than zero, thus, the Swedish IPOs are underpriced.

2.2 Underpricing

A phenomenon standing in contrast to the effective market hypothesis is the anomaly called underpricing, where the subscription price in an IPO is considerably lower than the realized first-day closing price. Thus, IPO underpricing offers an opportunity for investors to receive high short-term returns. van der Geest and van Frederikslust (2004) define the concept as follows:

> *"Underpricing is the positive return a shareholder can get when a new public share is bought at its offering price and is sold on the initial day of trading" (van der Geest & van Frederikslust, 2004; van der Geest & van Frederikslust, 2004),*

Underpricing is a well-researched phenomenon in the financial literature. A study on the Nordic market shows that underpricing is on average 17.1 percent on the Scandinavian market between 1991 and 2001 (Westerholm, 2007). In his paper form 1984, Ritter studies more than 5 000 IPOs worldwide between 1960 and 1982 and finds that, by selling the shares shortly after the start of trading, one can receive an average return of 18.8 percent (Ritter, 1984). There has been a handful of studies performed on the Swedish stock market, such as one conducted by Bodnaruk, Kandel, Massa & Thorsel (2008) using data between 1995 to 2001 and finding a market adjusted underpricing of 15 percent.

Much of the previous research has attempted to find explanations for the apparent underpricing of IPOs. A study made by Carter & Manaster (1990) shows that offers from well-reputed underwriters are associated with less risk and result in a lower degree of underpricing, which makes investors more confident in investing in that particular IPO. Their method of rating different underwriters' reputation is based on the underwriter's tendency to be the lead underwriter or not, and where among different underwriters was ranked in the different prospectuses. They find that the market adjusted return falls when the reputation rating inclined – or, in other words, the greater the reputation, the lower the underpricing (Carter & Manaster, 1990).

2.3 Information asymmetry

In his paper from 1970, Akerlof puts forward the concept of information asymmetry and its implications on prices. Information asymmetry occurs when a buyer and seller have different information about a product (Arkelof, 1970). When a buyer is unsure about the quality of a product due to lack of information, the buyer uses a market average to value the product. At the same time, the seller has more information about the specific product and as a result can offer worse products at a higher price. This results in a discount for the buyer when the risk is taken into account.

This asymmetry could explain the underpricing and abnormal returns seen in IPOs. Previous research has shown that founders and/or management of issuing firms naturally possess more

information about the firm than future investors (Dierkens, 1991). This leads to a situation where information asymmetry arises, even though the IPO prospectus exists in order to minimize it. The effects of this will be that an investor will demand either more information, or a discounted price as compensation for the information risk. In this way, information asymmetry work to explain the observed underpricing of IPOs, as underpricing is a way to encourage future investors to buy into the IPO.

Other research has shown that there is a risk the IPOs are overvalued as a result of the insiders' greater knowledge than investors. To get mitigate this problem, sophisticated investment banks and other parties are involved to estimate a "fair" price of the stock. However, according to Booth & Smith (1986), IPOs often work as a wealth transition from the early owners/management/founders to new investors. As a result of this, they argue there will be more overvalued firms going public than undervalued. To overcome this problem, the price must be lowered to make sure the transaction (the IPO) will take place. This has similarities to Akerlof's article, where the average price must be lowered due to an information asymmetry.

2.3.1 Principal agent theory

The principal agent problem occurs when the issuing firm (principal) selects an underwriter (agent) to assist in the listing process, where the agent acts in its own interest, not always aligned with the principal's interest (Jensen & Meckling, 1976). The issuing firm's ambition for going public can be to raise as much money as possible by selling shares relatively expensive. However, the underwriters' incentives can be the opposite, as they might want to favor their own investors, a more difficult objective to reach if the valuation is higher. By setting the price low, underwriters also increase the possibility of shares getting sold. According to Arikawa and Imad'Eddine (2010), the principal agent theory is the leading cause of underpricing. They further suggest that underpricing is becoming more severe when the underwriters bargaining power becomes larger (Arikawa & Imad'Eddine, 2010).

2.3.2 Signaling theory

Uncertainty during IPOs is usually related to the underwriter's size and reputation as well as to market conditions and firm size (Karlis, 2000). Although information asymmetry between the issuing firm and the underwriter can in part be explained by the principal agent theory, signaling theories can help to reduce the effect of asymmetry between the underwriter and the investors.

This is visualized in the Appendix 8.1. In order to reduce investors' uncertainty regarding an IPO, the underwriter can set the offering price low in an attempt to signal that the offering is appealing and "leave a good taste" with the investors for the future development of the share. The investors tend to favor the firms which can afford to underprice and further can regain the cost of underpricing (Allen & Faulhaber, 1989). On the other hand, the underwriter can also use other signaling mechanisms, besides underpricing, in order to maximize the outcome from the IPO. Karlis (2000) define signaling theories in IPOs as:

> *"Signaling theories are abundant and empirical models which attempt to explain IPO underpricing through signaling have had limited success. Although insider share retention and investment bank reputation are among the more significant variables in many regressions, there are a host of other possible explanations." (Karlis, 2000, p. 22)*

The study by Carter & Manaster (1990) shows that offers from well-reputed underwriters are associated with less risk and result in a lower degree of underpricing, which makes investors more confident in investing in the particular IPO. Carter & Manaster, together with Karlis' studies about how the size and reputation of the underwriter affects underpricing, has inspired our second hypothesis.

Hypothesis 2: Larger underwriters are associated with higher positive short-term abnormal returns post IPO compared to smaller underwriters by setting the offering price lower.

Furthermore, Karlis (2000) paper on signaling theories has also inspired us to investigate other possible explanations to as why it seems that IPOs are in general underpriced and thus generate abnormal returns. In addition to the underwriter size as an explanation for abnormal post IPO returns, we examine five more variables in this paper, namely issuing firm size, the state of the stock market, the cost of the IPO, the amount guaranteed by institutional investors prior to the IPO as well as the issuing firm's age.

2.4 Winner's curse

Rock (1986) observed the underpricing of IPOs and linked it to Akerlof's theory of asymmetric information. Underpricing often leads to higher interest from investors, leading to

oversubscription. When an IPO receives much interest from retail and institutional investors, retail investors often end up receiving a smaller stake of the IPO. On the other hand, if the interest is smaller, the chance of retail investors receiving what they signed up for increases. The result of this is if a retail investor "wins", in other words receive shares, the general demand for the IPO might be lower and the IPO might thus perform worse, and vice versa, explaining the name Winner's curse.

Furthermore, Rock (1986) means that underwriters can give uninformed investors incentives to take part in more IPOs by setting the price lower. Therefore, by underpricing, both uninformed and informed investors will participate. Rock says that this is a tool to ensure the shares will be sold and could be a part of the explanation of the underpricing phenomenon.

3. Methodology

This thesis examines the performance of IPOs on the Swedish market through a quantitative study. The aim of the study is to find evidence of contributing factors to underpricing and short-term abnormal returns. Firstly, the underpricing, defined as the difference between subscription price and first day closing price, is measured for each IPO in our sample. Thereafter, an event study has been conducted consisting of the market adjusted performance for fifteen days after each IPO. Five multivariate regressions has been conducted in an effort to find explanatory variables for the results given in the event study and answer the research questions. Many studies on the topic focus on the first day return *or* short-term return. We have chosen to include both in our study to test different explanatory variables for the returns in the post IPO window.

3.1 Underpricing

There are different ways in which previous research has measured the initial return and there are difficulties to observe any consensus about which method to use. Some of the aspects to consider are what price data to use, if the return should be adjusted for market movements and during what period to measure. However, previous studies mentioned by Westerholm (2007), uses the price from the first day of trading when measuring the over or underpricing, arguing it is the most up to date method. Hence the same method will be used in this paper. Further, we have chosen to compare the offering price of the IPO with the closing price of the first day, and not the volume weighted average price. This is in order to replicate other recent studies.

Regarding the market returns, some studies have chosen to not deduct the return of the corresponding market index from the IPO return on the initial day of trading. This is due to the fact that indices tend to move significantly less than IPOs on the first day, resulting in the adjusted returns becomes insignificant and are effectively similar to the unadjusted returns. However, since the returns after the first day of trading will be adjusted for market movements, this study will go against previous research and adjust the initial returns for market movements (adjust the returns against particular indices). Hence, the formula to calculate the under/over pricing will be as follows:

$$Unadjusted\ under\ or\ overpricing\ = \frac{(P_1 - P_0)}{P_0} \quad (1)$$

$$Adjusted\ under\ or\ overpricing = \frac{(P_1 - P_0)}{P_0} - Market\ return \quad (2)$$

P_1 Closing price of IPO on the first day of trading

P_0 IPO subscription price

The t-test for the over or underpricing will be calculated the same way as for the Event study. For a more detailed explanation, please see equation (8).

3.2 Event study

To evaluate the returns post IPO, an event study has been conducted. An event study is an empirical analytical tool which examines the effect of a specific event. The study can analyze events occurring in different points of time and give crucial insight in how securities will react to a given event. The event study is said to be originally constructed by Ball & Brown (1968) and Fama, Fisher, Jensen, & Roll (1969), however according to Campbell, Lo, & MacKinlay (1997) the original published event study was made back in 1933, by Dolley (1933). The following is the equation built by Fama, Fisher, Jensen and Roll.

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \quad (3)$$

R_{it} Expected return for share *i* during the period *t*

α_i Idiosyncratic risk for share *i*

β_i Systematic risk for share *i*

R_{mt} Return of the market portfolio during the period *t*

ε_{it} Error term for share *i* during the period *t*

Since there is no historical information about the stock price before an IPO, the adjusted market model has been used, by setting alfa equal to 0 and beta equal to 1, which is in accordance with previous study made by Chenine & Saro (2007). After the adjustments of alpha and beta, the error term has been calculated for each IPO in order to extract the abnormal returns for each IPO, displayed in equation (4). The stock price returns have been deducted by the corresponding index to obtain the abnormal returns. Van der Geest and van Frederikslust (2004) used the same method by deducting the benchmark indices, hence the same method is chosen in this thesis. The chosen indexes are: OMX Stockholm Large Cap PI Index, OMX Stockholm Mid Cap PI Index, OMX Stockholm Small Cap PI Index and First North All Share SEK Index. In absence of historical index data on the Spotlight market, First North All Share SEK has been used as the corresponding index.

$$AR_{it} = \boldsymbol{\varepsilon_{it}} = R_{it} - R_{mt} \quad (4)$$

AR_{it} Abnormal return of share *i* during the period *t*

When constructing an event study, one can choose between two different methods for obtaining the abnormal returns, the Cumulative Abnormal Return (CAR) and the Buy-and-Hold Abnormal Return (BHAR). CAR focuses mainly on the short-term returns, while BHAR is used for long-run event studies. Since the study solely focuses on IPOs and the effect of underwriters, a decision was made to focus strictly on the CAR since the authors expect underwriters' effect is the most prominent in the short-term after IPO rather than long-term. The decision to focus on CAR is also backed by research since BHAR risk to produce more skewed results partly because of the compounding effect and survivorship bias (Kothari & Warner, 1997).

The method for the event study and the corresponding t-tests was inspired by the book by Campbell, Lo, & MacKinlay (1997) as well as previous studies covering the same topic Chenine & Saro (2007), Grönlund, Louko, & Vaiheskoski (2008), and Anderson & Dyl (2008). The following paragraphs will explain the chosen methodology more exhaustively.

The post IPO period (event window) is split into different fractions of time, leading to a multiple of different event windows being used to analyze the post IPO behavior of the stocks in short-term. The first window is called Underpricing and measures the first day returns compared to the offering price, the second window is the event day plus three days after. The third window is the event day plus five days after. The fourth window is the event day plus 10 days after. Lastly the fifth window is the event day plus 15 days after. This division of the post IPO period is visualized in figure 8.3 of the appendix.

The abnormal returns, explained in equation (4), have been summed in order to receive the cumulative abnormal return (CAR), displayed in equation (5). The CAR has been calculated between the day of the IPO and up to 15 days after, identifying the short-term performance of the 216 firms individually.

$$CAR_{it} = \sum_{i=t}^{T} AR_i \quad (5)$$

After measuring the CAR of the 216 firms post IPO, the CARs across the securities were aggregated, giving us the Cumulative Average Abnormal Returns (CAAR) for each IPO in the sample (equation (6)). The event window is the time elapsed after the event. As mentioned, the event in this study is the initial day of trading. In the formulas below, t1 to t2 represents the days in the event window. All periods from the event day up until fifteen days later have been measured. Furthermore, the variance of the CAAR have been calculated, shown in equation (7).

$$CAAR(t_1, t_2) = \frac{1}{n}\sum_{i=1}^{n} CAR_i(t_1, t_2) \quad (6)$$

$$Var[CAAR(t_1, t_2)] = \sigma^2(t_1, t_2) = \frac{1}{n^2}\sum_{i=1}^{n}(CAR_i(t_1, t_2) - CAAR_i(t_1, t_2))^2 \quad (7)$$

N Number of events

t_1, t_2 Time measured between the event day (t1) and up until a maximum of fifteen days

$CAAR(t_1, t_2)$ Cumulative average abnormal return for stock i from time t_1 to t_2

Further, to test if our results differ from zero, a t-test has been conducted. In accordance with the previously mentioned study by Chenine & Saro (2007) a normal distribution is assumed:

$$CAAR(t_1, t_2) \tilde{} \mathrm{N}(0, \sigma^2(t_1, t_2)) \quad (8)$$

N Normal Distribution

$\sigma^2(t_1, t_2)$ Variance from time t_1 to t_2

To examine if the observed cumulative average abnormal return is statistically significant a t-test has been conducted. According to Campbell, Lo, & MacKinlay (1997) there are different ways of measuring a statistic. Our data shows a higher variance where the abnormal returns are larger. Campbell, Lo, & MacKinlay (1997) suggests it is more suitable to choose the test which gives equal weight to the cumulative abnormal returns for each IPO, which is the method that has been followed. The following formula has been used to calculate the test statistic:

$$t = \frac{CAAR(t_1,t_2)}{\sqrt{\frac{VAR(CAR(t_1,t_2)}{N}}} \sim N(0,1) \quad (9)$$

The results from the event study are later divided on the size of the underwriters. The underwriters have been categorized based on their revenue into four different quartiles. Inspiration of this has been gathered from Carter & Manaster (1990) which focused on the underwriter's reputation. They based their reputation on how often the particular underwriter was a lead underwriter, or a second, third and fourth tier underwriter. However, when studying their results, one can see that the highest-ranking underwriters often had the highest revenue, such as Goldman Sachs and JP Morgan. We did not find their method applicable on the Swedish market since our research shows that it is often a single underwriter handling each IPO, hence the "ranking system" would not have worked.

3.3 Multivariate Regressions

In order to examine what aspects contribute to possible underpricing and short-term abnormal returns, multiple of regressions have been conducted. The initial thought was to do a simple regression with underwriter size as the independent variable, but after researching previous studies, multivariate regressions were chosen for the analysis. The decision allowed us to test

other possible explanations as to why stocks develop abnormally post IPO, since signaling theories does point at multiple explanations.

3.3.1 Regressions

In total, 5 regressions have been conducted containing the same explanatory variables, but with different dependent variables. The dependent variables are as following (1) Underpricing, (2) CAAR 0 – 3 days after IPO, (3) CAAR 0 – 5 days after IPO, (4) CAAR 0 – 10 days after IPO and (5) CAAR 0 – 15 days after IPO. The data was compiled in Microsoft Excel and the regressions was performed in Stata. When running the regressions, we received the coefficients and the corresponding test statistics, which will lay the foundation for the conclusions drawn for each independent variable. The formula for the regressions is as follows.

$$Underpricing = \beta_1 SIZE + \beta_2 MCP + \beta_3 HOT + \beta_4 COST + \beta_5 GUARANT + \beta_6 AGE + \varepsilon$$

The other four four regressions consist of the same independent variables but with different dependent variables, consisting of the cumulative average abnormal returns for the following time intervals, between 0-3 days, 0-5 days, 0-10 days and lastly 0-15 days after IPO, as dependent variables.

3.3.2 Variables

The analysis will attempt to examine the dependent variables by analyzing the following **6** independent variables.

SIZE Each IPO's underwriter's revenue during the full year of 2019 divided into 4 quantiles, 4 represents the largest underwriter and 1 smallest.

MCP Log (Total number of shares issued*Price per share)

HOT If the IPO was carried through during a hot month the variable that takes on the value 1, and 0 if during a cold month.

COST Cost of IPO / Offering size

GUARANT Guarantee commitments by institutional investors / Offering Size

AGE The total number of years between the founding of the firm and the year of the IPO.

The first variable, *SIZE,* tests our second hypothesis, namely if larger underwriters underprice more, and are associated with higher short-term returns, compared to smaller underwriters. The method chosen to express the underwriter size was to first collect data regarding the total revenue of all of the underwriters in the sample during 2019 and after that divide these into 4 quartiles. Many previous researchers have tested the prestige of the underwriter in contrast to our revenue-based approach. Lundqvist tested the underpricing using data during the dot-com bubble, however they did not reach statistical significance regarding the underwriter prestige and the level of underpricing (Ljungqvist & Wilhelm, 2003). We expect that the variable *SIZE* will act as a good proxy for the reputation for the underwriter, as discussed earlier and we expect that the size of the underwriter correlates positively with underpricing and short-term abnormal returns.

The second variable, *MCP*, has been chosen as it is a company-specific data point, helping to investigate the "size effect" in IPOs, which can have explanatory value when it comes to IPOs. This has been tested by Beatty & Ritter (1986), among others, finding a statistical significance regarding that larger companies are associated with less underpricing. Previous research done using data from the Indonesian stock market between 2007 and 2016 also found a negative correlation between firm size and underpricing with statistical significance (Singgih, Pricilia, & Lavista, 2018). The variable *MCP* has been constructed by log transforming the market capitalization of the issuing firm at the point of IPO, which is according to a method discussed in (Li & Dang, 2018). Other proxies for the "size effect" are discussed in their paper, such as Book-To-Market, total assets and total sales. However, we chose to use the most easily available data point for the firm size, namely market capitalization, and in order to reduce the variability, the data was log transformed.

The third variable, *HOT* was selected since research points at a higher underpricing, and general short-term positive abnormal returns, thereafter, in times of an up-going stock market. In a study done on the Mauritian Stock Exchange it was found that during "hot" periods firms tend to underprice to a higher degree than during "cold" periods (Agathee, Sannassee, & Brooks, 2012). To determine whether a particular month is hot or not, data has been used from the SIX Return Index (SIXRX), which presents the average development on the Stockholm Stock

Exchange. The monthly returns were averaged out and if the monthly return was above average, it received the dummy 1 and if not, 0. We expect that the variable *HOT* is positively correlated with the degree of underpricing and short-term abnormal return.

The fourth variable, *COST* was selected to complement the regression with a variable with possible explainable power to underpricing and short-term returns. The variable was conducted by dividing the total cost of the IPO, stated in the prospectus, with the total proceeds obtained from the IPO. Even though there is not much academic research regarding this variable, we hypothesize that if a firm encounter a high cost associated with conducting the IPO it does not have as much ability to "leave money on the table". This assumption leads to the hypothesis that the variable *COST* might have a negative correlation with the degree of underpricing and the short-term abnormal returns.

The fifth variable *GUARANT* is the ratio of the IPO that institutional investors have secured during the book building phase divided by the total offering. We have chosen this variable as a result of examining previous studies, highlighting a significance regarding this variable. In a study on the Italian stock market, a positive relation was found between the degree of the IPO secured and the degree of underpricing (Teti & Montefusco, 2021). This leads to the hypothesis that the variable *GUARANT* could be positively correlated with the degree of underpricing and the short-term abnormal returns.

The sixth variable, *AGE,* represents the age of the issuing firm at the point of IPO. The variable was chosen based on previous research, showing that firm age can affect the outcome of the IPO. A study of 1526 IPOs between 1975 and 1984 showed that there is a positive relationship between firm age (older than 20 years) and positive abnormal returns while the younger firms performed worse than the market, during a three-year period (Ritter, 1991). Even though the study mentioned previously examines relatively long-term returns, we still hypotheses that that the variable *AGE* correlates positively with the degree of underpricing and short-term abnormal returns.

3.4 Limitations of the method

Looking at the thesis, the event study has faced the most limitations. When constructing the event study, the authors often have 1. an estimation window, 2. event window and 3. post-event window. Since the study will use the initial trading day of the IPO as the event day and there is

no price data before the event, an ordinary estimation window will not be possible to obtain. In order to resolve this problem, a variety of approaches can be used. In the literature on event studies there are mainly two approaches to combat this problem, the matched firm approach (MF) and the portfolio matching approach (PM) (Smith, 2009). According to Smith (2009) these two approaches can be divided into 7 subgroups: a) Market Capitalization (MF) b) Industry (MF) c) Industry & Market Capitalization (MF) d) Market Capitalization and Book-to-Market ratios (MF) e) Market Capitalization (PM) f) Industry affiliation (PM) and g) Market Capitalization and Book-to-market ratios (PM). Smith shows the portfolio matching strategy performs badly with non-promising test statistics. Furthermore, the matched firm approach shows results with powerful test statistics. The industry affiliation was based on the standard industrial classification (SIC) which could have been replicated for the Swedish companies using their respective Swedish business classification code, better known as SNI codes. Further, book-to-market ratios would have needed to be obtained and compared for each company according to their SNI-code together with their market capitalization and book value. All this would be needed to solely calculate a proxy for a beta and an alpha before the IPO, for each company. However, since Smith has a narrower scope on the event study, his methodology would have been too time consuming for this thesis and drawn focus away from the purpose of this essay.

Instead of Smith's approaches, the method used for solving the lack of estimation window was inspired by Saro & Chenine (2007), which is, as stated earlier, set alpha equal to 0 and beta equal to 1. This method is a simplification, and in reality, the different companies would have obtained different betas and alphas. However, our sample contains 216 different companies, with different size and different sectors, and you could argue the firms with a lower beta will be compensated and evened out by those companies with a higher beta.

Another limitation that might affect the results of the study is the choice to adjust the IPOs on the Spotlight with the First North All Share Index. This is as stated earlier an effect of the lack of history for a relevant Spotlight index. However, the size of the companies regarding these two markets are smaller compared to Large, Mid, and Small Cap and hopefully will not change the result in any significant way.

As discussed in Section 3.3.2 there are many different proxies used, to construct the variables, in the financial literature for measuring the effect on the dependent variables. As a result of

this, we are aware that the proxies used might not be the most representable in every case. However, by stating this as thorough as possible, the objective is to decrease the effect of this limitation and maintain the robustness of the tests.

3.5 Ethical considerations

When writing a quantitative essay, it is less clear which ethical commitments to relate to in comparison with a qualitative one, which might for example include anonymity for interviewees. However, the paper *Ethical Guidelines for Statistical Practice* by the (American Statistical Association, 2018) lists multiple principles which we have read and tried to work in accordance with.

4. Data

The specified time period where the data has been collected is from 2017 January to 2021 March, which contains 216 IPO's. In an effort to minimize any biases in the data collected, a period has been chosen with different market characteristics. During this time, the market has largely consolidated from 2017 until March 2020 and experienced a crash during the COVID-19 outbreak (March-May 2020), followed by a sharp bull market until March 2021. This gives us anomalies in both directions of the market, which hopefully evens out any biases and capturing IPO behavior across different market sentiments. However, it should be noted that IPOs often occur when the market sentiment is positive (during "hot" markets).

The IPOs included in the sample were obtained from Affärsvärldens IPO-guide (Affärsvärlden, 2021). The site presents information of all IPOs on the Swedish market over the last couple of years. The data regarding the shares and indices performances has been obtained from the Eikon Thomson Reuters database.

Table I – Descriptive Characteristics of the IPOs
The following table presents the number of IPOs on each list, the average and median, the largest and smallest in regard to market capitalization (MSEK).

List	Number of Issues	Average	Median	Maximum	Minimum
Nasdaq Large	5	53 545	24 000	160 510	10 098
Nasdaq Mid	20	3 536	2 975	9 211	1 786
Nasdaq Small	12	1 121	1 145	1 583	565
First North	121	557	225	4 025	50
Spotlight	58	75	49	347	21

Table I makes it clear that smaller IPOs are more common, which could be explained by that it is often smaller companies that are in need of new equity and choosing to go public IPO. Furthermore, it could be that smaller companies have a lower credit score, complicating financing via bonds or corporate loans, thus making an IPO a more attractive funding avenue.

Naturally, there are larger companies on the larger lists, which are related to the market cap requirements for Large, Mid and Small Cap. The market capitalization must be at least 1 billion Euro to enter the Large Cap, at least 150 million Euro for mid Cap and up to 150 million Euro for small Cap (Nasdaq, 2020). The requirements for an IPO on the Spotlight market and First North are somewhat lower regarding bookkeeping and other compliance, which also can explain the reason why smaller firms are choosing those markets when going public.

While there can be, and often are, multiple underwriters involved in an IPO, we have chosen to solely include the *lead* underwriter in the sample for this study. Bernoussi & Dereeper (2010) describes the role of the lead underwriter as follows.

> *"The lead underwriter is responsible for the preparation of the IPO, the marketing operation (road-show and warm-up). It controls all the aspects of the offering, including how many shares of stock co-managers get to sell, the timing of the road-show and the ultimate pricing of the deal." (p.4 Bernoussi & Dereeper, (2010))*

As it is clear that lead underwriters have a great responsibility in setting the offering price, we expect that there may be explanatory value in which lead underwriter is chosen. Including all involved financial advisors could potentially carry further explanatory power, but we have chosen to limit the scope of our study and focus on the most important of them. Appendix 8.3 shows the number of IPOs grouped by the lead underwriter. It sheds light on the fact that 136 (63 percent) of the IPOs are performed by the top ten underwriters categorized by number of IPOs. It can further be observed that the underwriters that have undertaken the greatest number of IPOs tend to list smaller companies. The size of the companies in regard to market capitalization, that Sedemera FK and InWest Corp. are underwriters to, are small compared to the average size of all IPOs in the sample (74.4 MSEK compared to 4 705 MSEK). Further, only three of the top fifteen most active underwriters list companies with an average size above 1 000 MSEK.

Table II - Descriptive statistic multivariate regressions
The following table consists of information regarding the variables of the regression, it includes the number of observations, the mean, median, standard deviations, how the variables were created as well as the name of the variables.

Data for Variables	Retrieved from	N	Mean	Median	Variables constructed by	Name of variable
Underwriter rev. (MSEK)	Annual reports	42	11 543	121	Quartiles	SIZE
Market Cap (MSEK)	Prospectus	216	1 909	200	Log transformation	MCP
Monthly returns	SIXRX	51	1.32%	1.97%	Dummy	HOT
Cost of IPO	Prospectus	216	9.05%	8.90%	(%)	COST
Guarantee	Prospectus	216	55.46%	59.30%	(%)	GUARANT
Firm Age (years)	Prospectus	216	14	9	Log transformation	AGE

Table II presents the data regarding the variabels. Most of the data for the variables have been collected through each IPO's prospectus to the investors. We have decided to log transform two

variables, market cap of the firm as well as the age. This was done to allow the data to follow a more normal distribution and hence reduce the variability of the data.

Based on the data presented in Appendix 8.3, there is a large spread regarding underwriter revenue. In order to combat this, the underwriters have been divided into 4 quartiles when performing the event study and the multivariate regressions, something that have been done by Chenine & Saro (2007).

When conducting the regressions, there is a need to detect if the sample is associated with heteroscedasticity. In order to do this, a Breusch-Pagen Test has been conducted. The Breusch-Pagen tests the null hypothesis that the error variance is all equal. The results, presented in Appendix 8.2, shows p-values ranging from 0.6339 and 0.2334, and with a significance level of 5 percent the null hypothesis in this test could not be rejected, leading to the conclusion that we assume that the data does not suffer from heteroscedasticity. Nonetheless, we conduct regressions with robust standard errors, as it is standard practice in economic and financial analysis.

In addition to testing for heteroskedasticity, the independent variables have been tested for multicollinearity. The purpose of this test is to highlight possible flaws in the estimation validity. If the test shows that the variables suffer from multicollinearity, the implications could be that if one particular variable changes, there is a risk that another variable change accordingly. If the correlation coefficient is lower than 0.8, one can assume very low risk of collinearity. The test was carried through by testing the independent variables correlations with each other, and the results are presented in a correlation matrix in the Appendix 8.5. The highest correlation coefficients observed was between the variables *SIZE* and *MCP* (0.672), leading to the conclusion that there does not exist any multicollinearity in any of the independent variables. Furthermore, *COST* had a negative correlation with both *SIZE* and *MCP (*-0.481 and -0.562 respectively). The rationale behind this finding is somewhat intuitive. Larger firms tend to hire larger underwriters. In this thesis *COST* is presented as a percentage of the total proceeds from the IPO. Underwriter fees relative to the total proceeds tend to decrease as the proceeds increases, a statement supported by information on the auditing firm PWCs website (PWC, n.d.). If this is taken into consideration, the results of the multicollinearity test do not come as a surprise, and we expect that the test does assure that there is no collinearity and thus does not affect the validity of the results presented in the thesis.

5. Empirical results & analysis

This section presents the findings and the corresponding analysis. First, the results and analysis from the test of the first day event study is presented and analyzed (section 5.1). Second, the results are presented and analyzed regarding the Cumulative abnormal returns (section 5.2) and last, the results and analysis are presented from the multivariate regressions (section 5.3).

5.1 Event Study – Abnormal Returns on the Listing Day

Previous research presented in earlier sections of this thesis showed an apparent underpricing regarding IPOs. The methodology for measuring the underpricing and its corresponding test statistics is mentioned in section 3. To test the first hypothesis, which is that Swedish IPOs are underpriced, we will measure how much the market adjusted initial day of trading differs from 0. The measured t-statistic must be compared to the corresponding critical values, which are ± 1.64 for a confidence level of 90 percent, ± 1.96 for a confidence level of 95 percent and ± 2.58 regarding a confidence level of 99 percent.

Table III - Overpricing or underpricing
The table below presents the Under or Overpricing of the 216 IPOs in the sample for each market. The results consist of the Average abnormal returns (%) (AAR), Standard deviation (%), T-test statistic, median (%), and lastly the maximum and minimum return (%).

	AAR	SD	T-test	Median	Maximum	Minimum
Nasdaq Large	13.08%	18.84%	(1.55)	10.38%	38.46%	-13.23%
Nasdaq Mid	14.57%	16.91%	(3.85)**	11.88%	55.24%	-11.58%
Nasdaq Small	7.94%	11.32%	(2.43)***	4.56%	38.24%	-1.73%
First North	9.16%	32.60%	(3.09)**	3.02%	140.83%	-70.95%
Spotlight	7.67%	40.42%	(1.46)	-1.57%	124.04%	-63.17%
Total	9.37%	32.74%	4.197**	3.59%	140.83%	-70.95%

1. *, **, *** denotes significance at the 0.1, 0.05 and 0.01 level.

As hypothesized, the results show that there is an abnormal return for the first day of trading compared with the offering price which implies a significant underpricing regarding IPOs on the Swedish stock markets, which is significant at all significance levels for the market in total. The measured average abnormal return for the first day of trading compared to the offering price is 9.37 percent. The implication of this is that an investor can earn an excess return on the markets by participating in the IPO, which means buying before the first day of trading at the offering price and selling it at the end of the first day. One could argue that the market is inefficient when it comes to IPOs, since there is nothing particularly happening to the firm beyond that its shares become publicly traded. However, Rock (1986) comments should not be

ignored, he argues that not every participant has the possibility to partake in every IPO, and especially retail investors. This could lead to a price that does not reflect all available information before the IPO because not every participant has the possibility to affect the price, and not everyone who signed up to buy the shares will get them. To defend the semi strong efficient market hypothesis by Fama (1970), the shares are not traded before the IPO, which means that the pricing of the shares before are not priced efficiently, which could be the explanation for the abnormal returns and the underpricing recorded in our sample. In other words, the offering price is the underwriter's valuation for the firm, which does not imply that the market agrees on its valuation.

However, it should be noted that the abnormal results are not significantly different from zero regarding the Nasdaq Large Cap market and the Spotlight market, even though the measured average abnormal returns are higher than zero. This is somewhat notable since it is the list with the largest respectively smallest firms listed.

When looking at the previous studies made by both Westerholm (2007) and Ritter (1987), they are showing a higher underpricing than what has been found in this paper. Ritter's thesis shows an underpricing of 18.8 percent while Westerholm's research shows an underpricing in the Scandinavian markets of 17.1 percent on average. One implication of the lower return in our sample, 9.37 percent, is that the markets have become somewhat more efficient by leaving less money on the table. Our sample is also containing 42 different underwriters of the 216 different IPOs, which could imply that there is a high competition between the underwriters, leading to lower underpricing and more equity raised to the companies.

Earlier research shows that selling founders and management are possessing more information regarding the firm going public (Dierkens, 1991), and new investors would need a discounted price or more information in order to participate in the transaction. However, this is not always the case since our sample also contains examples of overpricing, where the worst performer in the sample lost 70 percent of its value the first day of trading. This could be an explanation for the otherwise high abnormal return shown in Table III. The effect this could be that there has to be a discount in order for other investors to take the risk because of less information obtained regarding the firm than the selling owners in an IPO.

5.2 Event Study - Cumulative Abnormal Returns

Our first hypothesis suggests that there is a short-term average abnormal return for the Swedish IPOs, which is in accordance with previous studies mentioned earlier.

Table IV - T-test of AAR & CAAR from T0-T15

All IPOs in our sample are included in the results of this table. The table displays the event day (1), the average abnormal returns of each day (%) (2), the test statistic for the AAR (%) (3), the cumulative average abnormal return (%) (4) and the test statistic measured for the CAAR (5).

Event Day (T)	***AAR (%)***	**Test Statistic**	***CAAR (%)***	***Test Statistic***
(1)	(2)	(3)	(4)	(5)
0	9.37%	(4.20)***	9.37%	(4.12)***
1	-0.16%	(-0.51)	9.21%	(4.11)***
2	0.02%	(0.06)	9.24%	(4.03)***
3	0.44%	(0.70)	9.67%	(4.14)***
4	0.28%	(0.70)	9.95%	(4.14)***
5	-0.46%	(-1.43)	9.49%	(3.89)***
6	-0.01%	(-0.02)	9.48%	(3.82)***
7	-0.26%	(-0.84)	9.22%	(3.73)***
8	-0.08%	(-0.22)	9.15%	(3.68)***
9	-0.51%	(-1.44)	8.63%	(3.49)***
10	0.63%	(1.30)	9.26%	(3.67)***
11	0.02%	(0.04)	9.28%	(3.54)***
12	0.68%	(1.44)	9.95%	(3.69)***
13	-0.51%	(-1.23)	9.46%	(3.58)***
14	-0.70%	(-1.57)	8.74%	(3.23)***
15	0.30%	(0.53)	9.04%	(3.17)***

1. *, **, *** denotes significance at the 0.1, 0.05 and 0.01 level.

CAAR is significant for all of the days post IPO, showing that the underpricing is the main reason for abnormal returns post IPO. AAR, which measures the average abnormal return for each day after the IPO, presents a dull picture of the post event window. It shows average abnormal returns which are much lower than the initial day of trading. This could imply that the market is adjusting the underpricing of IPO almost immediately and the price discovery mechanism of the markets is working at a fast pace. Furthermore, it is interesting to see that if the first day returns are removed, the period from T1 to T15 shows a negative return of -0.337 percent, however, these negative returns were not statistically significant, pointing at the abnormal returns are associated with underpricing, rather than the days after. This in turn could imply that the market is efficient, even its weak form, and corrects for the underpricing almost

immediately. The implications are that one cannot earn a higher risk adjusted return by just buying IPOs on the listing day, in opposite to receive allotment for the subscription price.

Table V - CAARs by Size of Underwriter

The underwriters were grouped based on revenue and divided into respective quartile. Quartile 1 contains underwriters with a revenue from 0 to 22 142 MSEK. Quartile 2 contains underwriters with a revenue from 22 841 to 120 826 MSEK. Quartile 3 contains underwriters with a revenue from 156 433 to 648 110 MSEK. The fourth quartile contains underwriters with a revenue from 1 047 700 to 1 115 000 000 MSEK.

	Event Window			
	T0-T3	**T0-T5**	**T0-T10**	**T0-T15**
Quartile 1				
No. of IPOs	61	61	61	61
CAAR	6.25%	6.81%	5.10%	3.11%
	(1.24)	(1.29)	(0.93)	(0.52)
Quartile 2				
No. of IPOs	55	55	55	55
CAAR	7.69%	4.72%	5.36%	8.16%
	(1.43)	(0.86)	(0.94)	(1.2)
Quartile 3				
No. of IPOs	68	68	68	68
CAAR	12.76%	13.88%	13.45%	12.36%
	(3.52)***	(3.66)***	(3.48)***	(2.89)***
Quartile 4				
No. of IPOs	31	31	31	31
CAAR	13.14%	13.61%	15.17%	14.95%
	(3.80)***	(3.76)***	(3.79)***	(3.38)***

1. *, **, *** denotes significance at the 0.1, 0.05 and 0.01 level.

Table V shows the cumulative average abnormal returns (CAAR) divided into four quartiles based on their revenue of the different underwriters. The results in the event study shows that only the IPOs performed with larger underwriters in our sample differ significantly from zero. Quartile 3 and 4 differs significantly from zero in all time periods measured, and in all confidence levels.

The underwriters in Quartile 4 compared to Quartile 1 shows that the CAAR from the day of the IPO (T0) until T15, registers an almost 5 times higher CAAR over the same time period, however, the underwriters result in quartile 1 are not statistically significant. Further, this could imply that underwriters larger in size, based on revenue, can give investors above market returns during IPOs.

Furthermore, the results are in line with our previously mentioned hypothesis, that larger underwriters would perform better than smaller ones. It was shown a positive average abnormal return significantly different from zero. Jensen & Meckling (1976) showed that the motives can differ between an agent and a principal, described earlier in section 2, which can translate in this case into the underwriter and the company. The results presented in table V raises the question if that is the case on the Swedish stock market. Larger underwriters could have larger incentives to give its own investors a higher return, rather than raising as much money as possible for the firm going public. Their bargaining power, due to the larger size could be greater, which in that case would be in line with the results earlier mentioned by Arikawa & Imad'eddine (2010). Looking at table V, the column furthest to the right, shows that the CAAR from T0 to T15 is becoming larger all the way from the first quartile to the fourth one, which could imply a greater underpricing, and a higher abnormal return the next coming days with a larger underwriter.

5.3 Multivariate regressions

The following table is the results of the multivariate regression analysis. The regressions consist of 6 explanatory variables each, for the underpricing and the cumulative average abnormal returns that are associated with the 216 IPOs analyzed.

Table VI – Multivariate Regressions

The following table presents the impact of 6 independent variables on IPO Underpricing and Cumulative Average Abnormal Returns. The first column displays the independent variables, and the 5 following columns show the results for underpricing, CAAR for 3, 5, 10 and 15 days after IPO.

Variables	**Underpricing**	**CAAR t = 0 - 3**	**CAAR t = 0 - 5**	**CAAR t = 0 - 10**	**CAAR t = 0 - 15**
(1)	(2)	(3)	(4)	(5)	(6)
Underwriter Size (SIZE)	0.035	0.038	0.036	0.046	0.057
	(1.26)	(1.30)	(1.21)	(1.39)	(1.46)
Issuing frim size (MCP)	-0.036	-0.064	-0.052	-0.082	-0.072
	(-0.74)	(-1.25)	(-0.98)	(-1.40)	(-1.12)
The state of the market (HOT)	0.103	0.116	0.112	0.115	0.096
	(2.28)**	(2.44)**	(2.23)**	(2.20)**	(1.58)
The cost of the IPO (COST)	-1.663	-1.482	-1.679	-1.709	-1.38
	(-3.02)***	(-2.74)***	(-2.82)***	(-2.64)***	(-1.82)*
Gurantee commitments of the IPO (GUARANT)	0.225	0.214	0.254	0.156	0.235
	(2.46)**	(2.34)**	(2.56)**	(1.45)	(1.90)*
Issuing firm age (AGE)	0.001	0.001	0.024	0.065	0.074
	(0.01)	(0.17)	(0.39)	(0.92)	(0.91)
CONSTANT	0.076	0.121	0.074	0.136	0.013
	(0.46)	(0.69)	(0.41)	(0.71)	(0.06)
Number of IPOs	210	210	210	210	210
Overall R-squared	9.21%	8.37%	8.49%	7.60%	6.12%
Period	17 - 21	17 - 21	17 - 21	17 - 21	17 - 21

1. *, **, *** denotes significance at the 0.1, 0.05 and 0.01 level.

There are a lot to be said about the results of the multivariate regressions. The most notable result relates to the second hypothesis, if large underwriters underprice more than smaller. Based on the regressions above, we cannot reject the mentioned hypotheses as the test statistics are not significant for underwriter size within any of the regressions. There are however positive coefficients for the variable *SIZE*, but none of them prove to be statistically significant. This entails that, even though we find that IPOs on average provide abnormal short-term returns, we cannot establish a statistically significant relationship to the size of the lead underwriter, at least based on underwriter revenue and sorting by quartiles. This finding goes in hand with the results in a study performed by Ljungqvist and Wilhelm, investigating underpricing during the dot-com bubble, where they could not find a statistically significant relationship between

underwriter prestige – adjacent to underwriter size – and the level of underpricing (Ljungqvist & Wilhelm, 2003).

The size of the company, *MCP*, have negative coefficients in all regressions but this is not statistically significant either. Previous research, mentioned earlier, done by Ritter (1984) and by Singgih, Pricilia and Lavista (2018) of IPOs on the Indonesian market between 2007 and 2016 also found a negative correlation between firm size and underpricing, but with statistical significance.

The dummy "*HOT"* has explanatory power for both Underpricing, CAAR 3 days, CAAR 5 days, and CAAR 10 days, which is consistence with previous research. This finding indicates that in times of upgoing markets, IPOs experience on average a higher abnormal return compared to average. However, the variable did not reach statistical significance for the 15 days CAAR.

It can clearly be seen that the variable *COST* has a statistically significant negative correlation with both underpricing and CAAR of 3, 5 and 10 days after the IPO (at the 1 percent level throughout regressions 2-5). We can thus conclude that, in our sample, the issuing firm runs less risk of leaving 'money on the table' if the cost of the IPO is high. However, an alternative interpretation from this could be that the high cost of an IPO scares investors away, signaling to the investors that the firm might not afford to underprice.

The variable *GUARANT*, which is the amount of the IPO guaranteed by institutional owners, carries explanatory power, significant at the 5 percent level for Underpricing, CAAR 3 days, CAAR 5 days and CAAR 15 days (but proved insignificant at CAAR 10 days). This is interesting and goes hand in hand with previous research by Karlis (2000). This could come as an effect of the firm signaling that the offer is appreciated by informed investors (institutional investors), giving the uninformed investors (retail investors) trust in the offer.

We find no statistical significance for the variable *AGE* in any of the regressions. However, it does show positive coefficients, leading to the conclusion that, in our sample, the age of the issuing firm does not explain the positive cumulative average abnormal returns. The study by Ritter (1991), which inspired the use of the variable *AGE*, did study a longer period of time, 3 years, which could potentially be the reason for the deviation in results between the studies.

In sum, the results show that it is difficult to predict how the market will price a company based on company-specific data included in our analysis. Likely, this is a result of the fact that there are many different explanations to as why a stock price move in a certain way.

6. Conclusion

6.1 Concluding discussion

One of the purposes of this paper was to investigate if there was any apparent underpricing on the Swedish stock market. Our sample containing 216 IPOs from 2017 to 2021 shows a statistically significant underpricing, where the average market adjusted returns of the initial day are 9.37 percent. We can therefor conclude that "Swedish IPOs are underpriced on average". However as discussed in section 5.1, we cannot reject the semi strong efficient market hypothesis since the shares are not traded before the event day, and the price might not reflect all the available information. It should be mentioned that investors however can get abnormal returns by participating in the IPOs and selling the first day of trading. However, if the Winner's curse did not exist and all investors were able to take part in IPOs, maybe it would result in a lower underpricing on the market.

Further, we can also see that there is statistical significancy of short-term average market adjusted returns for Swedish IPOs that are larger than zero, if the underpricing is included. This is in line with our first hypothesis "The short-term average market adjusted returns for Swedish IPOs are larger than zero, thus, the Swedish IPOs are underpriced".

Previous research mentioned, made by Carter & Manaster (1990) shows a negative correlation between the underwriter's reputation and the returns of IPOs. Their methodology of rating the underwriters, as presented in section 2 and 3, differs from our revenue-based way of ranking them. However, if one can assume that the reputation and revenue is giving somewhat the same categorization of the underwriters, the results presented in this thesis differ. Regarding our second hypothesis "Larger underwriters are associated with higher positive short-term abnormal returns post IPO compared to smaller underwriters by setting the offering price lower", based on the Event Study, the results show a statistically significant positive abnormal return for the larger underwriters. Regarding the smaller underwriters, their return was not statistically significantly different from zero. However, testing for the underwriter size in the multivariate regression, we reach the conclusion that our second hypothesis did not show any

statistically significant results regarding the underwriter size. The finding is something that clearly articulates the robustness of this method since it was tested through two separate tests and as a result of this, we cannot draw conclusions in that specific case. However, as mentioned earlier the conclusion reached by the multivariate regressions is somewhat in line with earlier studies. We can however say that we were not able reach a conclusion for the second hypothesis, "Larger underwriters are associated with higher positive short-term abnormal returns post IPO compared to smaller underwriters by setting the offering price lower", since we did not reach statistical significance in the regression.

The variable, *MCP* (Size of the issuing firm), was not statistically significant in any of the regression, which is in contrast to previous research, finding a significant and negative correlation between the size of the issuing firm and post IPO performance. We did, however, find statistical significance regarding three variables tested in the multivariate regressions. We found that the variables *HOT* (state of the market), *COST* (Cost of the IPO) and *GUARANT* (Guarantee commitments of the IPO) were statistically significant for at least four out of five regressions. The fact that the hot periods in the data correlates with positive returns does not come as a surprise since the majority of previous research done on this topic points to that view. The cost of IPO had a negative correlation with the post IPO performance. This could come as a result of the issuing firm who spent a lot to become publicly traded might not afford to underprice, supporting the rationale behind the signaling theories mentioned in Section 2.3.2. GUARANT did have a positive correlation with four out of five regressions, this could come as an effect of a limited supply of shares if the IPO is guaranteed to a high degree. We believe that the findings regarding COST and GURARANT can help to establish the assumption of the signaling theories, which point at different explanations to why stocks experience abnormal returns post IPO. By investigating more than one attributes concerning IPO performance one can find new possible explanations to this well researched topic.

6.2 Proposals for future research

During the writing of this essay, we have encountered many new possible research topics within this field. One proposal, amongst other, for future research could be to investigate the area with an investor's perspective and study the "Winner's curse" more thoroughly, based on the size of the underwriters. Westerholm (2007) shows that institutional investors get a large share of "hot" IPOs, which often are held by larger underwriters. Our findings suggest that there is a larger

underpricing and higher abnormal returns regarding IPOs on the Swedish stock market, however, it would be interesting to investigate if all the market participants have the possibility to exploit this opportunity.

Another proposal is to investigate the fact that larger underwriters are often performing "Greenshoe options" during an IPO, in order to stabilize the price and make sure it is not falling below the offering price. Future research could investigate how these transactions are affecting the abnormal returns during IPOs on the Swedish Stock Exchange.

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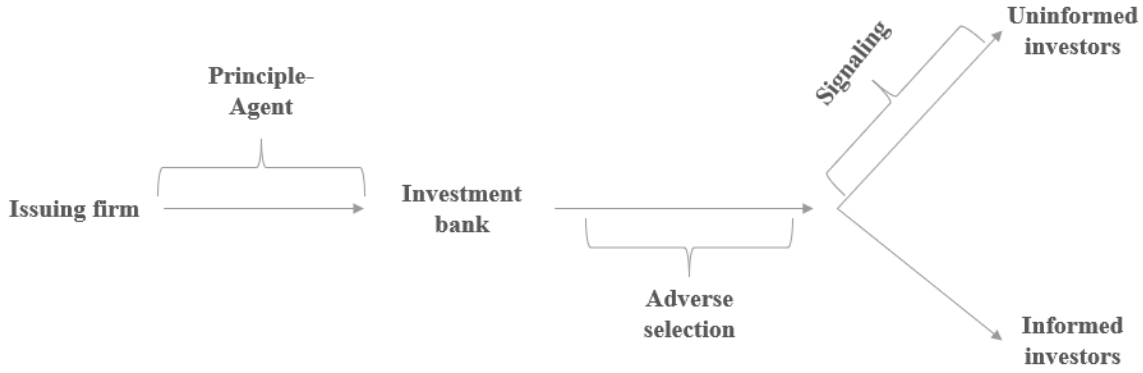
8. Appendix

8.1 Signalling theory



8.2 Breusch-Pagan heteroskedasticity test

Table IX - Breusch-Pagan test
The following table shows the results from the Breusch-Pagan test for heteroskedasticity

	Underpricing	**C3**	**C5**	**C10**	**C15**
Chi2 (1)	0.23	1.02	0.54	0.22	1.42
Prob > Chi2	0.6339	0.3136	0.4619	0.6396	0.2334

8.3 Event window figure

Figure II - Event Window

The following table illustrates the different event windows on which the study is based on.

Days after IPO	Underpricing	T0-T3	T0-T5	T0-T10	T0-T15
0					
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					

8.4 Underwriter descriptive statistics

Table VII - Underwriters descriptive statistics

The following table presents the revenue of the underwriters in 2019, as well as the number of IPOs each underwriter has carried through. The following columns presents data regarding the average, median, maximum and the minimum size of the IPOs in regard to market cap that each underwriter has performed. All columns are presented in millions of SEK, except for the number of Issues.

Name of Undewriter	Revenue	N. of Issues	Average	Median	Maximum	Minimum
Sedermera FK	121	27	86	70	292	38
Carnegie	2 613	26	2 782	2 147	10 098	539
InWest Corp.	2	14	53	47	106	29
Eminova	22	12	128	105	439	54
Mangold FK	156	11	435	112	2 988	50
Pareto	456	10	1 446	1 087	4 025	318
Redeye	100	10	369	296	873	102
Erik Penser Bank	363	9	317	329	488	152
G&W FK	54	9	165	123	501	76
ABG Sundal Collier	552	8	1 605	1 475	3 078	533
Partner FK	23	7	144	95	347	44
Vator	57	6	356	306	565	211
Avanza Bank	1 193	5	317	200	736	172
Arctic Securities	11	4	321	232	701	117
Corpura	12	4	76	119	142	43
Göteborg Corp.	16	4	121	125	97	136
No Underwriter	-	4	141	35	471	21
Nordea	90 668	4	2 804	2 672	3 700	2 169
Remium	4	4	144	151	170,0	99
SEB	50 134	4	1 649	1 623	2 547	803
Augment Partners	22	3	108	77	195	52
Capval Corp.	3,1	3	54	30	110	22
Danske Bank	21 221	3	1 537	1 158	2 316	1 137
Stockholm Corp.	57	3	316	323	420	206
Aqurat	12	2	61	61	90	32
Citigroup	618 949	2	92 555	92 555	160 510	24 000
Naventus Corp.	13	2	453	453	698	207
Aalto Capital	33	1	316	316	316	316
BofA Merrill Lynch	228 503	1	2 947	2 947	2 947	2 947
Catella	2 159	1	1 303	1 303	1 303	1 303
DNB	52	1	544	544	544	544
Företagsfinansiering FS	1	1	51	51	51	51
Handelsbanken	44 564	1	1 650	1 650	1 650	1 650
J.P Morgan	30 347 665	1	61 944	61 944	61 944	61 944
JAHI Corporate	2	1	140	140	140	140
Jefferies	6231	1	7 467	7 467	7 467	7 467
Morgan Stanley	130 787	1	11 175	11 175	11 175	11 175
Nordnet Bank	767	1	166	166	166	166
Skills Corp.	12	1	77	77	77	77
Söderlind & Co	2	1	174	174	174	174
Swedbank	45 960	1	914	914	914	914
Västra Hamnen	21	1	200	200	200	200
Total		215	4705	264		

8.5 Correlation table

Table VIII - Correlation table

The following table shows the correlation coefficients between the variables in the regression.

	SIZE	*MCP*	*HOT*	*COST*	*GUARANT*	*AGE*
SIZE	1,000					
MCP	0,672	1,000				
HOT	0,015	0,087	1,000			
COST	-0,481	-0,562	-0,029	1,000		
GUARANT	-0,286	-0,253	0,122	0,368	1,000	
AGE	0,213	0,296	0,172	-0,220	-0,049	1,000